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For ion exchange membrane, separator for capacitor and solid electrolyte for fuel cells.

**Proton conductivity porous film for ion exchange membrane and separator for capacitor, has preset porosity, and contains aliphatic hydrocarbon polymer having sulfonic acid group and proton acid**  
C2002-103461

### EXAMPLE

The porosity of the aliphatic hydrocarbon polymer porous film having sulfonic acid group, is 0.01-5 milliequivalent/g. The film contains a proton acid.

Electrical conductivity of the porous film is excellent.

## ADVANTAGE

An INDEPENDENT CLAIM is also included for the manufacture of the proton conductivity film. After adjusting the porosity of the polymer film having sulfonic acid group, to 0.01-5 milliequivalent/g, a proton acid is impregnated to the film. The porous film is then heated and melted such that porosity is reduced.

## DETAILED DESCRIPTION

USE

15 weight parts (wt.pts) of ultra-high molecular weight polyethylene resin and 85 wt.pts of liquid paraffin were mixed to form a slurry. Kneading was performed for 5 minutes at 160°C. Molding was performed to obtain a gel-like sheet of thickness 5 mm, followed by cooling. The sheet was heat pressed, immersed in n-heptane and subjected to simultaneous biaxial orientation at 125°C. Solvent was removed to obtain a porous film of film thickness 50  $\mu\text{m}$ , porosity 58% and average pore size 0.04  $\mu\text{m}$ . The porous film was subjected to gaseous phase sulfonation, to obtain a sulfonated porous film of thickness 60  $\mu\text{m}$ , porosity 45% and average pore size 0.05  $\mu\text{m}$ . The sulfonated porous film was immersed in 60 weight% of ethylene glycol solution of polyphosphoric acid, and was impregnated.

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Electrical conductivity of the sulfonated porous film was evaluated and found to be  $3 \times 10^2$  S/cm.

#### TECHNOLOGY FOCUS

Polymers - Preferred Film: The aliphatic hydrocarbon polymer porous film is a polyolefin resin film, preferably ultra-high molecular weight polyethylene resin porous film. The sulfonic acid group performs gaseous phase sulfonation of the polymer porous film. The film is subjected to melting.

Inorganic Chemistry - Preferred Acid: The protonic acid is sulfuric acid, phosphoric acid, polyphosphoric acid or sulfonic acid.  
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